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14 January 1981

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SCIENCE AND TECHNOLOGY

No. 43

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WEST EUROPE REPORT

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No. 43

CONTENTS

CHEMICAL

Expert Proposes Export of Alcohol Plants, Import of Ethanol
(SUEDDEUTSCHE ZEITUNG, 19 Nov 80) 1

ENERGY

Publication Outlines Energy Policies of EEC Nations
(SEMAINE DE L'ENERGIE, 27 Oct 80) 3

Two Years' Activity for Geothermal Prospecting Company
(ENERGIE, 28 Oct 80) 5

Gasified Residual Oil To Be Burned in Power Plant
(Norbert Andersson; NY TEKNIK, 25 Sep 80) 7

Wind Turbine Accident Illustrated
(NY TEKNIK, 11 Sep 80) 9

Exchange of Experiences With Wind Power Plants
(ELEKTRIZITAETSWIRTSCHAFT, 29 Sep 80) 10

EEC To Help Fund Photovoltaic Power Plants
(ELEKTRIZITAETSWIRTSCHAFT, 13 Oct 80) 12

Briefs
Geothermal Drilling Continues 14
Photovoltaic Cells 14
Themis Solar Power Plant 15
Fluidized-Bed Test Plant 15

SCIENCE POLICY

Report Out on General Orientation of Future Research
(AFP SCIENCES, 2 Oct 80) 16

Assessment of Sweden's World Standing in R&D Expenditures
(Rolf Myhrman; NY TEKNIK, 30 Oct 80) 19

CHEMICALS

EXPERT PROPOSES EXPORT OF ALCOHOL PLANTS, IMPORT OF ETHANOL

Munich SUEDDEUTSCHE ZEITUNG in German 19 Nov 80 p 27

> [Text] Biomass-derived fuel may be an interesting contribution towards solving the FRG's energy problem also. However, the necessary alcohol, ethanol, must be produced in countries where the plant raw material is continuously available throughout the year in order to permit uninterrupted production and to utilize the factories on more than a merely seasonal basis. Friedrich Jochum, chairman of the board of Maschinenfabrik Buckau R. Wolf AG, Grevenbroich, a company belonging to the Krupp combine, explains the chances and possibilities for producing alcohol from biomass.

Through the subsidiary companies, Buckau Wolf has been engaged for years in constructing factories for the utilization of plant materials. The 100-percent owned subsidiary Hermann, of Cologne, has been involved since the end of the 19th century with factories for manufacturing alcohol, and since then these activities have been completely absorbed into Buckau. Supraton GmbH, which is 51 percent owned by Buckau Wolf, has moreover developed a new process for digesting starch which is currently undergoing pilot-plant testing at the Institute for Fermentation Studies and Biotechnology in Berlin.

Known Technology

According to Jochum, the results are positive. The production of ethanol from regrowing plant raw materials such as sugar cane or manioc will assuredly permit, in the near future, an accessible means for getting out of an energy impasse, using known tehcnology, which is therefore immediately available. If the energy for producing alcohol accrues as a by-product--combustion of residues and waste is possible with both sugar cane and manioc--alcohol production in tropical countries today is immediately economically feasible. Jochum views this as being a means of granting aid for development which would simultaneously give a boost to German engineering, create jobs in the developing nations and have positive feedback effects on the German economy.

According to Jochum, developing nations could pay for ethanol-producing factories by shipping alcohol to the industrialized countries. In the Ivory Coast, for example, he showed that an investment of DM 2.5 billion in 22 alcohol plants could permit an annual ethanol production of 1.3 million tons, corresponding to about 5.2 percent of the German gasoline consumption. With an investment of DM 7.5 billion for 67 plants, one could get 4 million tons of ethanol per year, or 19.6 percent of the German gasoline consumption.

Moderate Manufacturing Costs

The manufacturing costs for this would run between DM 0.60 and 0.73 per liter, and at the same time 100,000-300,000 jobs would be created, especially in agriculture (planting and harvesting the sugar cane and manioc). After building a cane sugar plant in the Ivory Coast, Buckau Wolf found that the finished product could scarcely be absorbed by the sugar market. Things would be different with ethanol, according to Jochum.

Brazil and Japan are currently negotiating an alcohol project valued at 3 billion dollars for the Amazon basin. Brazil has already gone into manufacturing alcohol in a big way and plans to export alcohol to Western industrialized nations. The transportation costs from the Ivory Coast would be considerably less, at least for the FRG. If one compares ethanol production with a plan for coal liquefaction, then ethanol production is thoroughly competitive, explained Jochum.

8838
CSO: 3102

ENERGY

PUBLICATION OUTLINES ENERGY POLICIES OF EEC NATIONS

Paris SEMAINE DE L'ENERGIE in French 27 Oct 80 pp 13-14

[Article: "Energy: the European Solutions"]

[Text] In a pamphlet entitled "Europe in Brief - Energy, the European Solutions," the Commission of the European Communities reviewed the energy policy of the nine countries of the EEC, before specifying the objectives and actions of the common energy policy being undertaken and before concluding with an essential imperative: energy savings.

1) The Energy Policies by Country (an outline)

- Belgium:
    - . Stabilization of coal production
    - . Further development of nuclear energy and of gas installations
- Denmark:
    - . Doubling of coal between now and 1990
    - . Implementation of the heat plan
    - . Increased petroleum production
    - . Probable referendum on nuclear energy in 1981
- Ireland:
    - . Recourse to coal and peat
    - . Exploitation of the few hydrocarbon reserves
    - . Playing the wind energy card
- Italy:
    - . Reduction of consumption
    - . Increased recourse to coal
    - . Important (but hesitant) nuclear program
- Luxemburg:
    - . Reduction of industrial (steel industry) and private consumption
- Netherlands:
    - . Increased recourse to coal and gassification
    - . Reduction of gas production
    - . Move toward a debate on nuclear energy
- Federal Republic of Germany:
    - . Further development of coal
    - . Energy savings
    - . But opposition to nuclear energy

- United Kingdom: . Increased petroleum production (75 percent of the country's energy needs)
  - . Increased gas production (15 percent)
  - . Increased coal production
  - . Doubling of nuclear capacity (1990)

- France: . The energy program of France is better known by our readers. We refer the interested reader to the document, published this year by DOCUMENTATION FRANCAISE, "Energy: French Life."

2) The Energy Policy of the Communities

- 25 billion francs in investments, financed by the EIB, for energy savings, the development of national resources, the diversification of imports.

- Petroleum: avoid being cut off through judicious stockpiling, a 10 percent primary energy reduction if necessary, the search for new deposits, the diversification of supplies.

- Natural gas: the turning point of 1985.
  Raise the share of gas to 18 percent of energy consumption, develop retrievable reserves in the North Sea, improve the network of gas pipelines, continue drilling operations.

- Coal: yes, but. Conversion of thermal stations to coal, stimulate the use of coal in industry, develop new processes for production, transportation and transformation.

- Nuclear energy: a priority, security. The EEC has limited authority in the nuclear energy field. But nuclear progress is real there.

- Alternative sources of energy. Assistance is provided for the exploitation of solar and geothermal energy.

- Research occupies a choice position in the EEC. Nuclear energy has somewhat faded away to the benefit of thermonuclear pressure, the production of H2, geothermal energy and energy savings.

3) Energy Savings

To save energy is to underwrite an insurance policy for the future. This thought served as the vital lead for the Commission, which anticipated:

- 20 to 35 percent savings in transporation
- 15 to 35 percent in industry and agriculture
- 50 percent in the household and tertiary sectors.

8463
CSO: 3102

TWO YEARS' ACTIVITY FOR GEOTHERMAL PROSPECTING COMPANY

Paris ENERGIE in French 28 Oct 80 p 16

[Text] The Geochaleur company is undertaking at la Courneuve (Seine-St Denis department) its third geothermal prospecting project. About 20 other operations should be conducted soon, Mr Robert Lion, chairman of Geochaleur, told the press last Wednesday.

Mr Lion, who is also delegate general of the HLM [Low-Cost Housing Program] National Union, said that the firm has 2 years of activity scheduled. In all, he reported, its drillings will be able to supply over 60,000 housing unit equivalents, which means a savings of 80,000 tons of petroleum equivalent a year.

The program that has just begun at la Courneuve will affect 2,891 housing units of the HLM Public Office of the city, as well as various municipal facilities, amounting to 3,500 housing unit equivalents in all. The HLM Office is in charge of this program, requiring a total investment of 25.8 million francs. It is being financed 80 percent by a loan from the Geothermal Board and 20 percent by the public regional facility.

The drilling itself should take about 3 months. The geothermal equipment will become operational in 1981 and should meet 42.5 percent of the heating and hot water needs, amounting to savings of 1,969 TEP [Tons of Petroleum Equivalent] a year in the first phase, and then 2,500 TEP a year after the scheduled expansion to a second drilling in 1981 on the same site.

Two other operations have already been begun by Geochaleur since it was established: one for a 2,200 housing unit equivalent complex at Coulommiers, and the other at Montgeron, for 2,500 housing unit equivalents. The energy savings expected will be 3,500 TEP and 2,350 TEP a year, respectively.

The Geochaleur-National Company for the Application of Geothermal Energy firm was established in 1978 by the HLM National Union, the BRGM [Bureau of Geological and Mining Exploration], Charbonnages de France, the Caisse des Depots, and Credit Foncier de France.

Its goal is to provide builders of low and moderate-cost developments and local communities with technical and financial assistance. "For in the end," said Mr Lion, "they are the only ones who can feasibly implement such projects."

Geochaleur has a dual goal: to reduce energy imports, saving up to 1.3 TEP per housing unit per year, and to decrease the cost of heating for the consumers, by about 10 percent the first 3 years, and then 30 percent starting with the 4th year.

7679
CSO: 3102

ENERGY

GASIFIED RESIDUAL OIL TO BE BURNED IN POWER PLANT

Stockholm NY TEKNIK in Swedish 25 Sep 80 p 7

[Article by Norbert Andersson: "Gasified Residual Oil Burned in Power Plant"]

[Text] The world's first power plant to be fired with residual oil is planned for Lysekil. The sulphur-rich residual oil is gasified under high temperature. The gas drives a gas turbine, while the surplus heat drives a steam turbine. The power plant could be completed in 1985. The effect is calculated at 160 megawatts.

The plant is to be fired with residual oil, rich in sulphur, from oil refineries. Heretofore no use has been found for it in Sweden and it has been exported.

The oil is partially burned under high temperature and acid deficiency. The gas thus obtained is cleaned of sulphur and drives a gas turbine, which in turn drives a generator. Surplus heat from both the gasification process and the gas turbine drives a steam turbine coupled to a generator.

Less Pollution

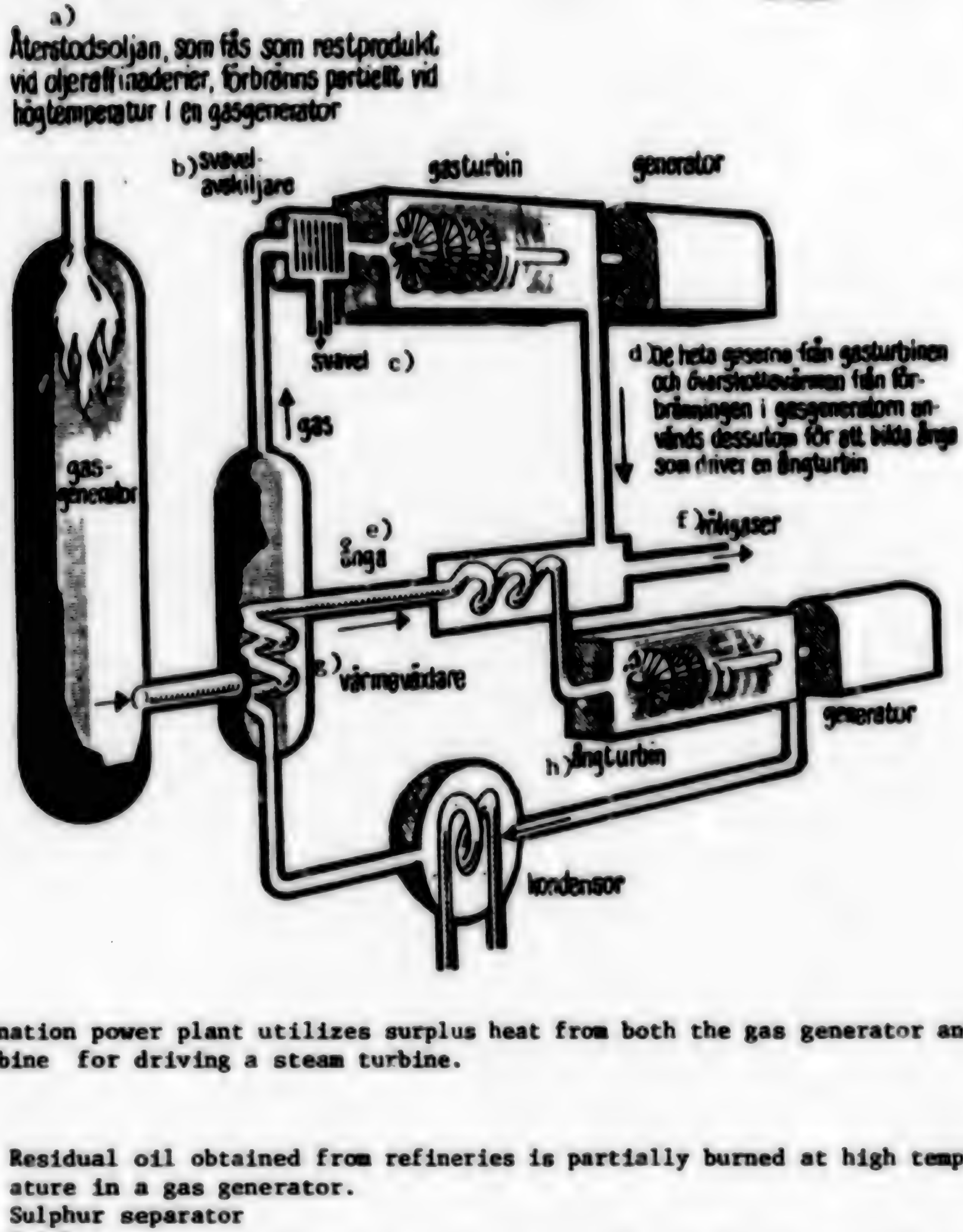
Emissions of sulphur, nitrous oxides, and heavy metals are lower in this type of power plant than in those using conventional combustion.

The parts of the system are based completely on conventional engineering. The new element is the combination of gasification with power production.

The demonstration plant of 160 megawatts now being planned is to be built in the Brofjorden industrial area in Lysekil. The project is being undertaken in cooperation among Swedish Petroleum, The Watercourses Administration, and SP Technology (formerly Statsraff.)

The planning work will be completed in 1981, and in 1985 the plant should be finished.

In the future this type of power plant may be operated with coal. "However, coal gasification technology is not yet mature and it is also costly," says Nils Elam, vice-president of SP Technology. He is convinced, however, that this type of combination power plant has a great future in Sweden.


a)
Återstodsoljan, som fås som restprodukt vid oljeraffinaderier, förbränns partiellt vid högtemperatur i en gasgenerator
b) svavel-avskiljare
gasturbin
generator
svavel c)
gas
gas-generator
d) De heta gaserna från gasturbinen och överskottsvärmen från förbränningen i gasgeneratorn används dessutom för att bilda ånga som driver en ångturbin
f) rökgaser
e) ånga
g) värmeväxlare
generator
h) ångturbin
kondensor

A combination power plant utilizes surplus heat from both the gas generator and the gas turbine for driving a steam turbine.

Key:

- a. Residual oil obtained from refineries is partially burned at high temperature in a gas generator.
- b. Sulphur separator
- c. Sulphur
- d. The hot gases from the gas turbine and surplus heat from combustion in the gas generator are also used to produce steam which drives a steam turbine.
- e. Steam
- f. Smoke gases
- g. Heat exchanger
- h. Steam turbine

11,256
CSO: 3102

ENERGY

WIND TURBINE ACCIDENT ILLUSTRATED

Stockholm NY TEKNIK in Swedish 11 Sep 80 p 7

[Text] Sweden's first wind-driven power plant--the lime kiln at Alvkarleby--fell to the ground last week. The entire turbine enclosure fell from the top of the concrete tower, a drop of 23 meters. No strong wind or design error caused the fall of the power plant. The accident occurred when the turbine housing was to be lowered to the ground by means of a crane for overhaul and rotor exchange. The mobile crane was unable to handle the 7.5 ton turbine housing and it shifted and dropped. The accident injured no one, but material damage was great.

Most of the research program at the wind turbine plant is already completed, and it is not certain that it will be rebuilt.

11,256
CSO: 3102

ENERGY

EXCHANGE OF EXPERIENCES WITH WIND POWER PLANTS

Frankfurt/Main ELEKTRIZITAETSWIRTSCHAFT in German 29 Sep 80 pp 772-773

[Text] A group of specialists of the Schleswag Aktiengesellschaft, the Hamburgische Electricitaets-Werke AG (HEW) and the Maschinenfabrik Augsburg-Nuernberg (MAN) gathered information on the situation of the plants on the Nibe-Fjord in Aalborg (Denmark) financed jointly by the Danish Government and the power industry.

Henning Gastrup, a civil engineer who has been in charge of the project since 1977, said: Unfortunately, we have not finished duplicating the old windmills." The starting difficulties have been much greater than expected since September 1979. Actually the basic assumptions had been agreed upon, but, as often happens, the "nuts and bolts" are giving trouble. Problems may have occurred in the plant controlled by microprocessors in different wind directions and velocities, also in the hydraulic systems (for example, the sheet angle shift).

In an exchange of views with the Growian Inspection Council chairman, Dr (of engineering) Clausnitzer (HEW), Inspection Council member and Schleswag Director Manfred Brohmeyer (Dipl. Ing.) and the heads of the Growian company Jens Niese (Schleswag) and Helmut Mitschel (HEW), the Danish engineers did not make any secret of the difficulties. Since September 1979, the first of the two wind power plants has only operated for about 149 hours. Result: About 28,000 kWh were fed into the neighboring 20 kV network.

In August 1980, the second "windmill" built with a different rotor suspension is to begin operating.

The first Nibe wind power plant on the green meadow is, with a tower height of 45 m, not even half as tall as the Growian planned in the Kaiser-Wilhelm-Koog at 96.6 m (Table 1).

The overall program pursued in Denmark since 1977 will cost about 32 million Danish crowns. About 19 million Danish crowns of this money must be allotted to the two Nibe windmills. The costs for Growian, most of which will be borne by the Federal German Research Ministry, are presumed to be approximately DM 50 million. In this connection it may be mentioned that the German research project is technically more complicated and more extensive.

		Nibe	Growian
Tower height	m	45	90.6
Rotor diameter	m	40	100.4
Power	kW	630	3000
Work (expected average annual yield)	GWh	1.5	12

Whereas the Nibe project, which has a favorable location from the point of view of wind conditions, reaches a total capacity of 630 kW for about 10 percent of the time (about 30 days), the German planners expect a full load (3,000 kW) for about 25 percent of the time (3 months).

9018
CSO: 3102

EEC TO HELP FUND PHOTOVOLTAIC POWER PLANTS

Frankfurt/Main ELEKTRIZITAETSWIRTSCHAFT in German 13 Oct 80 p 817

[Text] The EEC is planning to build, in collaboration with individual state authorities, public bodies, industry and other establishments, on the basis of cost participation, more than a dozen power generators operating with photovoltaic cells, with a power of 30 to 300 kW in Europe. All the plants combined will have an electric power of about 1 MW. They will be completed by the middle of 1983.

This type of generator has not so far been built in Europe. In this project emphasis is laid on development of innovative techniques. Finally it should be proved with the plants, that the concept of generation of electricity from solar energy is economically feasible in Europe. At the same time, this program should give an encouraging stimulus to the solar energy electrification projects in developing countries, since it is creating the necessary technological principles. The solar power plants are to be selected from more than 30 proposals, which were received by the EG in May 1980. The proposals stem from many European consorti, who have thus responded to a call for bids published earlier within the framework of Solar Energy Research and Development Program of the GS (XII) Research, Science and Education.

The reactions on thepart of the European industry were livelier than expected, and show that increasing interest is being aroused by the solar cell technique.

The commission proceeds from the principle that, as a rule, at least one plant will be built in each member country of the European Community, even those located in the north.

This is possible because the photcells work with high efficiency not only with direct solar irradiation, but also under cloudy skies and even during rain, assuming that some brightness is still present.

Solar power generators will be used predominantly on islands, in which the problems of power supply by ordinary means is not always easily solved.

"Solar electricity" can also be used to supply small municipalities, agricultural plants such as dairies, hospitals, schools and holiday resorts. A plant is to be built in Sicily in the immediate vicinity of Eurelios, the 1 MW solar power plant of the European Community, which operates with a steam cycle, and is to be commissioned by the end of 1980. This would provide the unique opportunity of comparing a plant working on the photovoltaic principle with a thermodynamic solar power plant.

All the projects are part of the program of the Commission for the Use of Solar Energy with Photovoltaic Cells, which also includes 35 study contracts on new solar cells and corresponding components on which the contracts are now being negotiated.

From 27 to 31 October 1980, the commission is organizing in the Palais des Festivals et des Congres in Cannes, a conference on photovoltaic technology, which is expected to be attended by 600 delegates from all over the world. The co-organizers of the conference are the Paris "Commissariat a l'Energie Solaire" [Paris Solar Energy Commission] and the IEEE, New York.

9018
CSO: 3102

BRIEFS

GEOTHERMAL DRILLING CONTINUES--In Coulommiers, in the Seine-et-Marne department, it will be possible to heat part of the city by geothermal energy starting in the winter of 1981-1982, since the second well drilled for reinjection by deflection has just been successfully completed. This operation, conducted for the Joint Geothermal Energy Board in Coulommiers by the BRGM [Bureau of Geological and Mining Exploration], will be able to heat 2,200 housing unit equivalents (HLM [Low-Cost Housing Program] complex, hospital, school facilities), and it will save 3,400 TEP [Tons of Petroleum Equivalent] a year. Last July, the first well, at a depth of 2,000 meters, reached porous limestone at the Dogger level, containing water over 80 degrees in temperature with a sufficient flow (200 cubic meters per hour). The second well which has just been drilled will permit the geothermal field to be exploited by using a "doublet" system; the hot water extracted by the producing well, once it is cooled after extraction of its calories in the heat exchanger, will be sent back to the same level by the reinjection well. The Coulommiers operation may be considered the archetype of the geothermal heating developments that are being conducted in the Parisian basin. [Text] [Paris AFP SCIENCES in French 23 Oct 80 p 30] 7679

PHOTOVOLTAIC CELLS--Elf-Energies, a newly formed subsidiary of the New Elf-Aquitaine Company, is about to sign an agreement with the CGE [General Electric Company] on photovoltaic cells. This agreement is to set up a subsidiary in which the CGE would hold a majority of the stock, with Elf-Energies having large minority holdings. The CGE is the French industry that is probably most advanced in this field, and is the only one which is involved with the government's photovoltaic plan. Since 1978 the CGE has been associated with the Rhone-Poulenc group for research and development of silicon-based materials and flat products. In 1979 it set up two joint subsidiaries with the Sensor Technology firm (Dyneer group), the third U.S. manufacturer of solar cells, and it is now turning toward the development of true solar systems. Elf-Energies has just entered the photovoltaic field, by its acquisition of minority holdings in the Bureau Yves Houssin and the Catel firms. Catel is an Ivory Coast firm, and we should mention here that the CGE is also involved in the Ivory Coast, through its subsidiary, Photowatt Afrique, which will produce photovoltaic generators and modules in Abidjan starting next year. [Text] [Paris ENERGIE in French 28 Oct 80 p 17] 7679

THEMIS SOLAR POWER PLANT -- The cost of the Themis solar power plant under construction in Targassonne amounts to 128 million francs for a life span of 20 years. The nominal power of 2300 kilowatts should produce 3 gigawatt/hours net per year, with an average yearly energy yield of 16 percent. The plant includes 200 heliostats, constituting a surface of 10,740 square meters. Thermal stockpiling is achieved by a mixture of salts (sodium, potassium) melted at a temperature of 290 to 400 degrees Celsius; its capacity is equivalent to 5 hours of sunlight. [Text] [Paris SCOOP ENERGIE in French 15 Oct 80 p 8] 8463

FLUIDIZED-BED TEST PLANT--A coalburning power plant with a fluidized-bed chamber is planned in Malmo. The final decision has not yet been made, but the intention is to build a combustion chamber of 15 watt thermal effect. It will operate at 850° C and 1.6 MPa [expansion unknown]. Stal-Laval Turbine, Inc., and Asea-Atom are planning the installation, built only to test on a full scale the process for coal combustion developed by Stal-Laval. A single gas turbine of special construction for the test is to be made. Further, the heat taken out for steam production is measured in full scale works, of the kind Stal-Laval plans to build in the United States. (Described in NY TEKNIK, 1980:35). [Text] [Stockholm NY TEKNIK in Swedish 18 Sep 80 p 17] 11,256

CSO: 3102

REPORT OUT ON GENERAL ORIENTATION OF FUTURE RESEARCH

Paris AFP SCIENCES in French 2 Oct 80 pp 1-2, 4

[Excerpts] I. Policy and Organization of Scientific Research

Ten-Year Program, France. Paris. "Le Livre Blanc sur la recherche" [The Research White Book]. On 3 September, Pierre Aigrain, secretary of state for research, forwarded to the president of the republic the White Book on Research. The subtitle of this voluminous document of more than 500 pages is "Building the Future" and expresses its purpose, that is to say, the place which research must occupy in the nation and, more precisely, what we can expect of scientific research during the 10 years to come.

The White Book on the one hand constitutes "a kind of fresco of scientific and technical knowledge indispensable to the culture of the "sincere man" of the 20th Century as it draws to a close; on the other hand it replaces the research effort made by France in a 10-year time frame which gives it a prospective outline. "Enlightening the voter," as the "decision maker," on the organization and orientations of research, it "prepares the way to the future"--as it says in the introduction.

The White Book, published by Documentation francaise in 10,000 copies was released to the public on 1 October in the afternoon after submission to the cabinet by Mr Aigrain.

According to its drafting committee--made up of high-ranking personalities in science with contributions from numerous researchers--the White Book "reflects the entire scientific community," its own reflection upon the sciences, technology, their development during the years to come, the place which they have in our society, and their contribution to progress."

A famous physicist by the name of Jacques Friedel, member of the Academy of Sciences and professor at the University of Paris-South, chaired the White Book Drafting Committee which included specialites from all disciplines. Scientific institutions, such as the Academy of Sciences, the National Committee of the National Scientific Research Center, the Scientific Council of the National Institute of Health and Medical Research, the conference of university presidents, etc., were involved its preparation.

The White Book consists of two parts. The first one is a very detailed analysis covering vast sectors of research, including industrial research, but not military research. The eight chapters devoted to it outline the state of knowledge and indicate the most promising fields where we are liable to see either conceptual breakthroughs or a rapid development of practical application.

The second part illustrates relations between the economy, science, and society and is a reflection on France's scientific policy so that the potential of the 300,000 persons involved in research in France may be used in the best possible fashion; the total financial effort will exceed F 50 billion in 1981 for research and development.

Commenting on the White Book in talking to the press, Mr Pierre Aigrain said: "This book is a goldmine. Many people are going to benefit from it. We will be the first in the government, in the various ministries, to use it as a source of information and inspiration." He however took care to place things in proper perspective by stressing that the White Book "is neither a blueprint for the government, nor a promise of specific results to be obtained by a specific date."

Indeed, although this document contains suggestions as to the creation of one or the other laboratory or the implementation of a research program here and there, the White Book overall does not spell out any specific objectives but rather comes up with general guidelines (AFP-Sciences will present an analysis of these guidelines in its next issue).

The White Book is coming out now because on that same day the president of the republic, in the cabinet, asked the government "to add a seventh priority to the six which had been listed during the debate on the preparation of the Eighth Plan, that is to say, to raise French scientific research to the level of the most advanced countries." "Scientific and technological research," Mr Pierre Aigrain indicated, on this subject, "will not only involve a priority effort but will be one of the major options and even the first option under the plan."

For Professor Jacques Friedel, member of the Academy of Sciences, who was the chairman of the White Book Drafting Committee--whose members on 1 October were received for a luncheon at Elysee [Palace]--"The task of reflection and drafting was not easy and the final product is not perfect." "The White Book was written by real researchers and that explains its length and its sometimes dull character but it is solid and substantial and it represents the general agreement of the scientific community." He added that "It was difficult to foresee the future and this is why the document in question rather outlines probably evolution of science and technology and what that might mean from the viewpoint of practical application and effects on the life of the French."

Major Scientific Activities Scheduled for the 1980/1990 Decade

I. Basic Research

1. LEP (Large Electron Positron) project at ECNR;
2. French participation in scientific program of European Space Agency;
3. Completion of Ganil (national heavy ion accelerator) at Caen (1982);

4. Synchrotron radiation machine (European Synchrotron Radiation Facility);
5. Completion of telescopes with millimetric interferometer (in collaboration with West Germany) (1986);
6. French participation in SPACELAB program;
7. VENERA probe for Venus;
8. Improvement of SATURNE, synchrotron accelerator with proton;
9. Second run of high-flux reactor of Laue Langevin Institute (French-Anglo-German).

II. Completed research

1. Completion of THEMIS solar power plant (1984);
2. Remodeling of Charcot oceanographic vessel (1981);
3. Construction of two new oceanographic vessels (starting in 1985);
4. Completion of Rennes pig-breeding station [as published; "porcine"; piscine(?)--pool];
5. Civilian participation in PHEBUS (high-power laser);
6. Completion of JET (Joint European Torus), within the framework of Euratom (1983);
7. New Tokomak TORESUPRA.

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SCIENCE POLICY

ASSESSMENT OF SWEDEN'S WORLD STANDING IN R&D EXPENDITURES

Stockholm NY TEKNIK in Swedish 30 Oct 80 pp 8-9

[Article by Rolf Myhrman]

[Text] Sweden is continuing to increase its research effort. This is shown by the latest OECD report, which has just been published.

The increase is occurring even though government appropriations are declining.

The reason is that Swedish firms are engaging in increasingly intensive research and reaching first place in world statistics.

The new OECD statistics show the development of R&D among the member countries up to and including 1977.

The OECD countries investing the most money in R&D are the following, in descending order: the United States, Japan, the FRG, France, and Great Britain. In 1977 those countries invested a total of more than $82 billion (345 billion kronor) in R&D. That amount is approximately equal to Sweden's entire gross national product (GNP) for that same year.

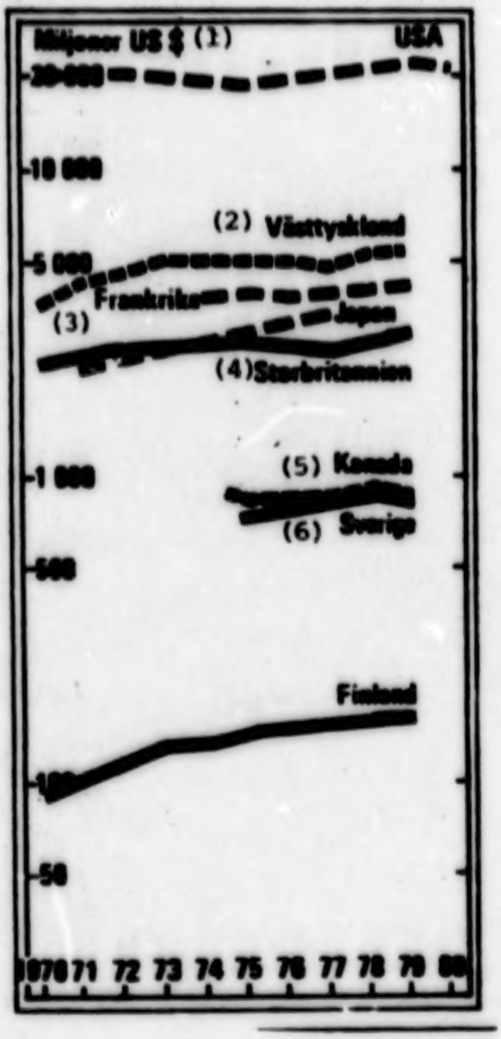
Ninth Place

Sweden ranks ninth in total R&D effort.

Sweden spent about 6.3 billion kronor on R&D in 1977. (But the statistics for Sweden do not include R&D in the social sciences and humanities, in contrast to all the other countries included in the statistics.)

If research funds are viewed in relation to the GNP, the figure for Sweden is estimated at 1.9 percent for 1977.

In the OECD, that figure is exceeded by the United States (2.4 percent), Switzerland (2.3 percent), the FRG (2.1 percent), Great Britain (2.1 percent), and the Netherlands (2.0 percent). (See the second diagram below.) Japan is at the same level as Sweden, while France shows 1.8 percent. The other countries are all below 1.5 percent.



Government-financed research in some OECD countries from 1970 through 1980 is shown here. The amount is shown in U.S. dollars at 1975 prices. Note that the scale is logarithmic. The figures for 1979 and 1980 are based on budgeted costs in the various countries. The diagram shows that government R&D appropriations in Sweden are beginning to decline if calculated at constant prices.

Key:

1. Millions of U.S. dollars
2. West Germany
3. France
4. Great Britain
5. Canada
6. Sweden

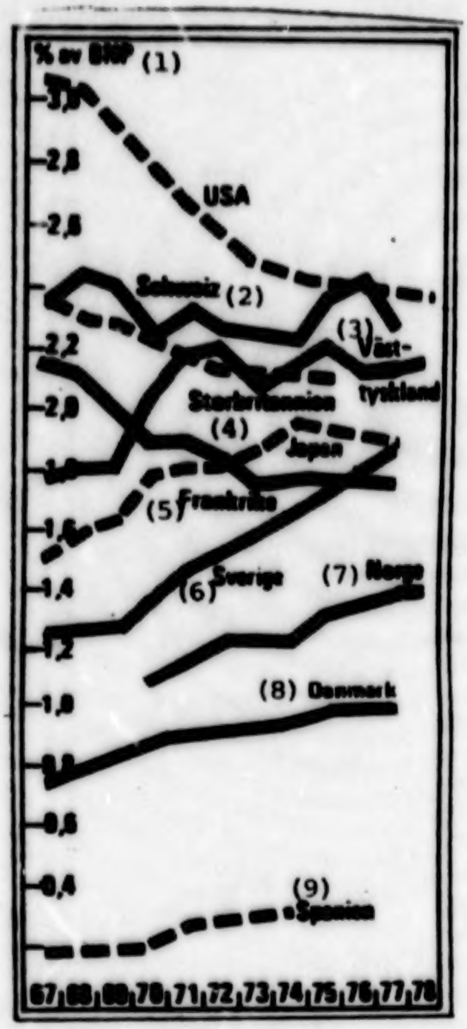
Norway, for example, devotes 1.4 percent of its GNP to research and development. The figure for Finland and Denmark is about 1 percent.

If we look at the figures for the private sector only, Sweden looks even better. The private sector includes both state-owned and private firms as well as research institutes that serve those firms.

More than half the research in all of the OECD's major R&D countries is assigned to the private sector. Sweden is one of the countries where the greatest share of R&D--nearly three-fourths--is done in that sector.

In NY TEKNIK No 38, we described the Swedish firms as being the leaders in R&D in the OECD group. This is confirmed by the new statistics.

If we look at the private sector's R&D effort in terms of what the firms contribute to the GNP, we see that Sweden is in first place. (This can also be stated as the private sector's R&D costs as a percentage of added value plus import duties.)



Total R&D expenditure as a percentage of gross national product for some OECD countries. The diagram shows the change from 1967 to 1977, expressed in constant prices. It includes all R&D within the particular country. If only the industrial sector's research is considered, Sweden is a little higher. One explanation for such a sharp increase in Sweden's R&D effort in the latter years of the period is that its GNP fell somewhat. With a rising R&D effort and a falling GNP, R&D's share of the GNP easily shows a solid increase.

Key:

1. Percentage of GNP
2. Switzerland
3. West Germany
4. Great Britain
5. France
6. Sweden
7. Norway
8. Denmark
9. Spain

Here Sweden achieves a figure of 2.0 percent, followed by the United States (1.9 percent), the FRG (1.6 percent), and France (1.4 percent).

In Sweden's case, that percentage has risen sharply in recent years. But at the same time, it must be remembered that industry--and its share of the GNP--declined during the same period.

There is another measurement for describing the intensity of research by private firms in the OECD countries.

That is the number of research workers in the private sector in terms of the total labor force (the number of persons of working age).

Here Sweden is in third place with a figure of 5.8 per 1,000. Switzerland and the FRG are ahead of Sweden, while Japan and the Netherlands are behind it.

Appropriations Drop

Government appropriations for R&D have increased in the OECD group as a whole. The increase is estimated at a little more than 5 percent between 1977 and 1979 (at constant prices).

Here Sweden is one of the few countries differing from the group as a whole. Calculated at constant prices, the appropriations have declined since 1978 (see the diagram).

In recent years, Denmark and Norway have also reduced their government appropriations for R&D.

The areas of government-supported research that are increasing the most within the OECD group are energy research and research into hospitals and health care.

Approximately one-third of the government research within the OECD is for defense purposes. The United States, Great Britain, and France account for 90 percent of that type of R&D.

Besides those countries, only Sweden and Switzerland spend more than 15 percent of their government R&D money on defense research.

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